Competency 1.1 **Industrial hygiene personnel shall demonstrate the ability to anticipate and recognize health stressors during the review of facility plans, designs, and operations prior to their implementation.**

1. Supporting Knowledge and Skills

a. Discuss how a review of the following can be used to anticipate potential health stressors.
- Raw materials
- Support materials
- Chemical reactions
- Chemical interactions
- Products
- By-products
- Waste products
- Equipment
- Operating procedures

b. Using data from an industrial hygiene assessment, determine the potential health effects resulting from exposure to the following:
- Irritants
- Sensitizers
- Corrosives
- Asphyxiants

c. Given an operation, evaluate the ergonomic hazards as they relate to the following:
- Work place design
- Interface between personnel and the workplace
- Hazards associated with repetitive motion tasks
- Work/rest cycle
- Environment extremes

d. Describe how the following affect engineering technologies to control exposure:
   - Design criteria
   - Unit operations
   - Design of control measures

e. Read and interpret relevant portions of design drawings, plans, and specifications.

f. Discuss the following types of health stressors found in the work place and the community and provide examples of each hazard.
   - Chemical
   - Biological
   - Physical
   - Ergonomic

g. Describe how the following sources of information can be used to assist in the anticipation of health stressors.
   - Standards
   - Regulations
   - Other sources

h. Conduct a review of facility plans, design, and/or operations and identify potential health stressors.

2. Recommended Reading

Review

- 29 CFR 1910.1030, "Occupational Exposure to Bloodborne Pathogens: Final Rule."
- 29 CFR 1926.62, "Lead Exposure in Construction: Final Rule."
- DOE Order 5480.10, *Contractor Industrial Hygiene Program*.
- *Fundamentals of Industrial Hygiene*, 3rd Edition, Parts 2 and 3 (Chapters 2 through 14), National Safety Council.
- *Occupational Diseases: A Guide to Their Recognition*, U.S. Department of Health, Education, and Welfare.

3. Summary

For some chemical processes, standard process descriptions can be found in chemical process references. Similarly, anticipated exposure patterns by operation, trade, or craft may be found in some references. Both may be of assistance in anticipating occupational exposure, although in most cases the exposure anticipated may reflect working conditions of 20 or more years ago, or in operations not necessarily performed in DOE.

Exposure to chemical stressors may be anticipated from plans wherever materials are added to or removed from an otherwise enclosed chemical system. The need for the addition to, or sampling from, the process might be indicated on plans by the presence of enclosures or local exhaust at these locations. The presence in the plans of control booths for operators might indicate that the designer anticipates both noise and heat to be generated from the process.

Process information should contain a list of chemical ingredients and products and information about where and how ingredients would be added. The chemical ingredient and product information should allow a prediction about what stressors are within the system. However, they cannot predict how much could escape at the points where chemicals are added, products/wastes are removed, or where process samples are taken, or through fugitive emissions.

If significant exposure is anticipated by the designer for many maintenance operations, local exhaust ventilation should be provided for in the design. The characteristics of the collection system (such as canopy, hood, or glove box) are based on the type of exposure that may be anticipated.

Plans for decommissioning older DOE buildings should indicate the potential for exposure to asbestos and inorganic lead, as well as heat stress associated with the use of personal protective equipment. Exposure to asbestos should be anticipated during the removal of insulation, floor tile, and paneling materials. Exposure to inorganic lead well above the Permissible Exposure Limit (PEL), and to other anticorrosive coatings should be anticipated during the cutting, grinding, or burning of structural metals. Dismantling old chemical process systems and related ventilation systems will involve potential exposure to chemical agents that the systems previously processed.

Evaluation of the renovation plans for office environments may suggest the potential for future exposure. Modifying office space arrangements may obstruct the distribution of office air. Increasing occupancy may reduce the adequacy of outside air supplies. The addition of large pieces of office equipment may create emissions beyond the capacity of the current ventilation system, and may require isolation or local exhaust. General renovation involving painting, installation of carpeting, or new office furniture may also result in indoor air quality problems.

Anticipating the potential for exposure to stressors from plans, designs, and operation descriptions is an important step in planning. The evaluation of the potential for actual exposure, when all potential exposure variables are given, is the next step and involves measuring problem emissions and personal monitoring of the air that employees breathe. The performance of personal sampling as the means of assessing risk is a key function of the industrial hygienist.

4. Suggested Exercises

Please refer to Scenarios 4, 5, 8, and 10 in the Scenario section of this document.